

Accepted Manuscript

Arc evaporated W-alloyed Ti-Al-N coatings for improved thermal stability, mechanical, and tribological properties

S.A. Glatz, H. Bolvardi, S. Kolozsvári, C.M. Koller, H. Riedl, P.H. Mayrhofer

PII: S0257-8972(17)30882-4
DOI: doi:[10.1016/j.surfcoat.2017.05.097](https://doi.org/10.1016/j.surfcoat.2017.05.097)
Reference: SCT 22634

To appear in: *Surface & Coatings Technology*

Received date: 28 April 2017
Revised date: 30 May 2017
Accepted date: 30 May 2017



Please cite this article as: S.A. Glatz, H. Bolvardi, S. Kolozsvári, C.M. Koller, H. Riedl, P.H. Mayrhofer, Arc evaporated W-alloyed Ti-Al-N coatings for improved thermal stability, mechanical, and tribological properties, *Surface & Coatings Technology* (2017), doi:[10.1016/j.surfcoat.2017.05.097](https://doi.org/10.1016/j.surfcoat.2017.05.097)

This is a PDF file of an unedited manuscript that has been accepted for publication. As a service to our customers we are providing this early version of the manuscript. The manuscript will undergo copyediting, typesetting, and review of the resulting proof before it is published in its final form. Please note that during the production process errors may be discovered which could affect the content, and all legal disclaimers that apply to the journal pertain.

Arc evaporated W-alloyed Ti-Al-N coatings for improved thermal stability, mechanical, and tribological properties

S.A. Glatz^{1,2}, H. Bolvardi³, S. Kolozsvári⁴, C.M. Koller¹, H. Riedl¹,
and P.H. Mayrhofer^{1,2}

¹ Institute of Materials Science and Technology, TU Wien, 1060 Vienna, Austria

² Christian Doppler Laboratory for Application Oriented Coating Development at the
Institute of Materials Science and Technology, TU Wien, 1060 Vienna, Austria

³ Oerlikon Balzers, Oerlikon Surface Solutions AG, 9496 Balzers, Liechtenstein

⁴ Plansee Composite Materials GmbH, 86983 Lechbruck am See, Germany

Keywords: *Ti-Al-W-N; arc evaporation; thermo-mechanical properties; tribological behaviour; phase evolution; macro particles;*

Abstract

The protection of various tools and components through wear resistant coatings is imperative in highly efficient and precise industrial manufacturing processes. Especially, physical vapour deposited $\text{Ti}_{1-x}\text{Al}_x\text{N}$ and $\text{Cr}_{1-x}\text{Al}_x\text{N}$ coatings have been commonly used as hard protective coatings due to their outstanding thermal stability and mechanical strength. However, to increase the applicable working temperatures by simultaneously enhancing the wear performance (e.g., to allow for higher cutting speeds) further improvements are required.

Therefore, we studied in detail the impact of tungsten (W)—in combination with the substrate bias potential (U_{bias})—on the thermo-mechanical properties and wear performance of arc evaporated $\text{Ti}_{1-x-y}\text{Al}_x\text{W}_y\text{N}$ thin films. With increasing W content the quality of our coatings significantly increases due to pronounced reduction of growth defects (quantity of macro particles). All coatings studied crystallise in a supersaturated, single-phased face-centred cubic $\text{Ti}_{1-x-y}\text{Al}_x\text{W}_y\text{N}$ structure and their hardness (H) increases whereas the indentation modulus (E) decreases with increasing W content. This results in increased H^3/E^2 values, with a maximum of 0.19 GPa for $\text{Ti}_{0.50}\text{Al}_{0.41}\text{W}_{0.09}\text{N}$ prepared with $U_{\text{bias}} = -120$ V ($H \approx 35$ GPa, $E \approx 483$ GPa). All

Download English Version:

<https://daneshyari.com/en/article/8024750>

Download Persian Version:

<https://daneshyari.com/article/8024750>

[Daneshyari.com](https://daneshyari.com)